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Polyphase rifting and volcanism around the Jan Mayen Fracture Zone, NE Greenland

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In 2017, we sailed with the German Research vessel Maria S. Merian along the semi-ice covered NE Greenland margin to study the architecture of the rifted continental margin around the Jan Mayen Fracture Zone. The acquired multichannel seismic data provide a structural image of the sediments and crustal architecture. Acquisition was done using BGR's reflection seismic instrumentation with a 4500-m-long digital solid streamer and a G-airgun array with a total volume of 3100 in³. Key questions are the distribution of volcanism as manifested in seaward dipping reflectors (SDRs) and the continent-ocean transition. The new data indicate that the NE Greenland margin is broadly segmented into three segments and these have distinct tectono-magmatic styles. This implies a polyphase rift evolution with consecutive magmatic events. Phases of high magma supply and the formation of SDRs alternate with phases of tectonic deformation. SDRs in the central margin segment were the first to be emplaced before volcanic rifting took place in the northern margin segment. Finally, the SDRs in the southern segment were emplaced. Each phase likely overprinted the adjacent, previously rifted areas, resulting in tectonic deformation and local marginal uplift. We propose that this is a robust indication for ongoing extension after initiation of volcanic breakup. Overall, the volumes of SDRs decrease to north and to the south.